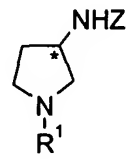
[0039] What is claimed is:

1. A process for the manufacture of 3-amino-pyrrolidine derivatives of the formula



I

wherein

$R^1$ signifies hydrogen or an amino protecting group;

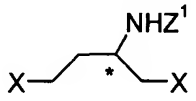
Z signifies hydrogen or an amino protecting group;

and

* represents a center of chirality,

which process comprises:

converting a compound of the formula



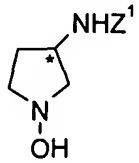
II

wherein

X signifies a protected hydroxy group; and

$Z^1$ signifies an amino protecting group;

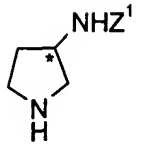
in the presence of hydroxylamine or an acid addition salt thereof into the N-hydroxy-pyrrolidine derivative of the general formula



III

and

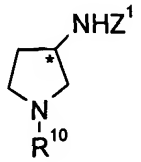
reducing the N-hydroxy group to the secondary amine of the general formula




IV

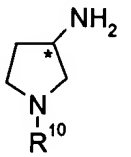
by hydrogenation with Raney nickel.

2. The process according to claim 1, further comprising protecting the secondary $N^1$ amino group by reaction with a compound of the formula $R^{10}X^1$, in which $R^{10}$ is an amino protecting group and $X^1$ is halogen or a leaving group, to yield a compound of the general formula




V

3. The process according to claim 2, further comprising deprotecting the secondary 3-amino group by catalytic hydrogenation to yield a compound of the general formula




VI

4. The process according to claim 1, wherein the center of chirality is in the R-form.

5. The process according to claim 1, wherein X is mesyloxy.

6. The process according to claim 1, wherein $Z^1$ is benzyloxycarbonyl.

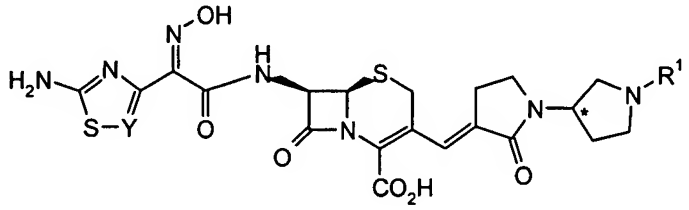
7. The process according to claim 1, wherein the starting compound of formula II is reacted with hydroxylamine hydrochloride.

8. The process according to claim 2, wherein the intermediate of formula IV is reacted with di-tert-butyl-dicarbonate.

9. The process according to claim 3, wherein the deprotection of the secondary 3-amino group of the intermediate of formula V is effected by catalytic dehydrogenation with palladium on charcoal.

10. The process according to claim 1, wherein each step is carried out under pressure.

11. The process in accordance with claim 1, wherein the 3-amino-pyrrolidine of formula I is further processed to a vinylpyrrolidinone-cephalosporin derivative of formula A



A

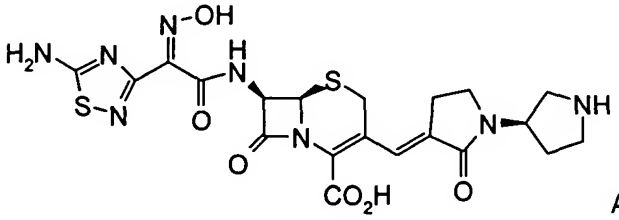
wherein

Y signifies CH or nitrogen;

$R^1$ denotes hydrogen or an amino protecting group; and

* denotes a center of chirality.

12. The process according to claim 10 for the production of (6R,7R)-7-[(Z)-2-(5-amino-[1,2,4]thiadiaol-3-yl)-2-hydroxyimino-acetylamino]-8-oxo-3-[(E)-(R)-2-oxo-[1,3']bipyrrolidinyl-3-ylidenemethyl]-5-thia-1-aza-bicyclo[4.2.0]oct-2-ene-2-carboxylic acid of the formula



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